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GOVERNOR OF HAWAII



**STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES**

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LAND  
STATE PARKS

OCCL:DE

November 18, 2004

**MEMORANDUM**

TO: Sam Lemmo , Administrator  
Office of Conservation and Coastal Lands (OCCL)

FROM: Dolan Eversole, Coastal Geologist  
Office of Conservation and Coastal Lands (OCCL).

SUBJECT: Results From Current Study Research September 13 nearshore Kuhio Beach, Oahu.

Dear.: Sam

In support of an effort to assess the sediment transport pathways of Kuhio Beach, Office of Conservation and Coastal Lands (OCCL) staff conducted a qualitative current study in Kuhio Beach on Monday September 13<sup>th</sup>, 2004. The survey was carried out by introducing a fluorescent dye in the nearshore waters of Kuhio Beach and observing the transport direction using time-lapse videography. While the project wasn't intended to produce quantitative results it did provide valuable information on the dominant nearshore transport direction in Kuhio Beach.

**Background & Methodology:**

The survey took place in the nearshore waters of Kuhio Beach fronting the Duke statue and the Police substation on September 13, 2004. The project lasted through a tidal change, roughly 8 hours from 9am to 5pm. A 6 to 10 foot (wave faces) south to southwest swell was occurring during the study and offered the opportunity to observe the nearshore currents during a swell. The swell data from the offshore wave buoy Station 51002 - SW HAWAII 215 NM South Southwest of Hilo indicated the swell was approximately 7 feet with a 12 second period for this swell event. The tides for the date were as follows:

Low Tide 8:35am (0.2 feet)  
High Tide 3:35 pm (2.1 feet)

The project entailed placement of approximately 200 ml of an inert, nontoxic fluorescent green dye (Fluorescein) on roughly hour intervals and observing the transport pathways of the dye. A digital video camera was setup on top of the Sheraton Moana Hotel and captured video time-lapse images of 1 second every 2 minutes. This video is viewable on line at: <http://www.hawaii.gov/dlnr/occl/files/Waikiki/QT-shrt.mp4>

As expected, the dye dissipated rapidly (roughly 30 minutes for each 200 ml sample) and showed no lasting impact to the environment. The dye is commonly used in a variety of oceanographic research and has been successfully used in Hawaii.

### Results:

The project consisted of placing approximately 200 ml of Fluorescein dye roughly 100 feet offshore fronting the Duke Statue at Kuhio Beach (Figure 1). Eight separate dye samples were released on roughly hourly intervals for a total of ml of dye. The summary of sample log is as follows:

Time	Tide	Dye Vol/ Location	Net Direction	Surf	Notes
9:25	Low ↑	200 ml- Duke Statue 50 feet offshore	NW- Alongshore towards Royal Hawaiian	4-6' Rising	Plume stayed within 30 feet of shoreline. Plume elongated
10:00	Low ↑	200 ml- Police Station 100 feet offshore	NW- Alongshore towards Royal Hawaiian. slow movement	4-6' Rising	Plume stayed within 30 feet of shoreline. Plume stayed round
11:10	Low ↑	250 ml- Dukes restaurant 200 feet offshore	NW- Alongshore towards Royal Hawaiian then inshore over sandbar. Very slow movement	3-5 '	Inconsistent surf when placed 10 -20 mins). Plume moved inshore over sandbar, then slowly out rip current
12:25	Low ↑	500 ml- Duke Statue 50 feet offshore	Very fast moving to NW. 10 mins to Moana Hotel.	4-8' Rising	Plume elongated and stayed close to shore.
1:30	High ↑	300 ml- Duke Statue 75 feet offshore	Stayed close to shore, slow movement to NW then faster movement once plume moved NW.	4-8' Rising	More consistent surf. Dye stayed within 20 feet of shore.
2:20	High ↑	200 ml- Duke Statue 100 feet offshore	Slow movement inshore and split to the east. Movement to NW once closer to shoreline.	6-8 '	Consistent surf. No longshore movement until close to shore (30 feet).
3:45	High	250 ml- Duke Statue 100 feet offshore	Movement to NW. Faster movement of plume than previous. 10 mins to Police Station.	6-10 ' rising	High Tide. Very consistent surf.
4:45	High ↓	250 ml- Duke Statue 100 feet offshore	Static plume. Very slow movement to NW close to shore.	6-10 '	More inconsistent surf.
5:20		Stopped			

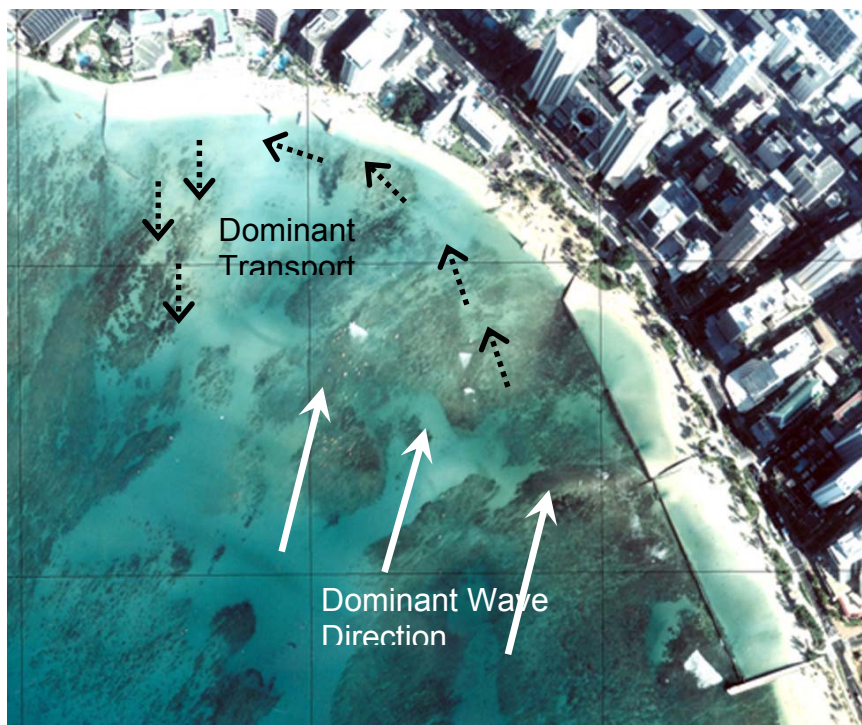
### Totals and Averages:

Total Time	Dye Volume	Net Direction	Surf
7:55	1970 ml	Dominant to NW- All 8	4 to 8 feet Ave

### Summary/Conclusions:

The results of the project indicate that the dominant transport direction is to the North West towards the Royal Hawaiian Hotel (Figure 2). This trend was continuous throughout the study and during all tides. All 7 samples that were introduced to the Kuhio Beach area displayed an alongshore migration to the northwest (Figure 3). Observations of the dye plume suggest that the transport rate diminishes immediately offshore. On several occasions the plume was observed to move very slowly to the north west until moving closer to shore (within 30 feet) where it appeared to accelerate and migrate rapidly to the north west suggesting the primary transport occurs close to shore.

One sample was delivered to the area fronting Duke's Restaurant offshore of the lifeguard tower (2A). This sample displayed a very slow movement inshore and alongshore to the north before moving out through a fixed rip current present fronting the Royal Hawaiian Hotel (Figure 4). It should be noted that the dominant transport directions (other than Kona storm events and unusual westerly winds) are thought to follow the observed trends on the day of the study. While the magnitude of the surf was higher than normal on the day of the study it is thought to represent the general direction during most periods and thus is a good approximation of the dominant transport trends.



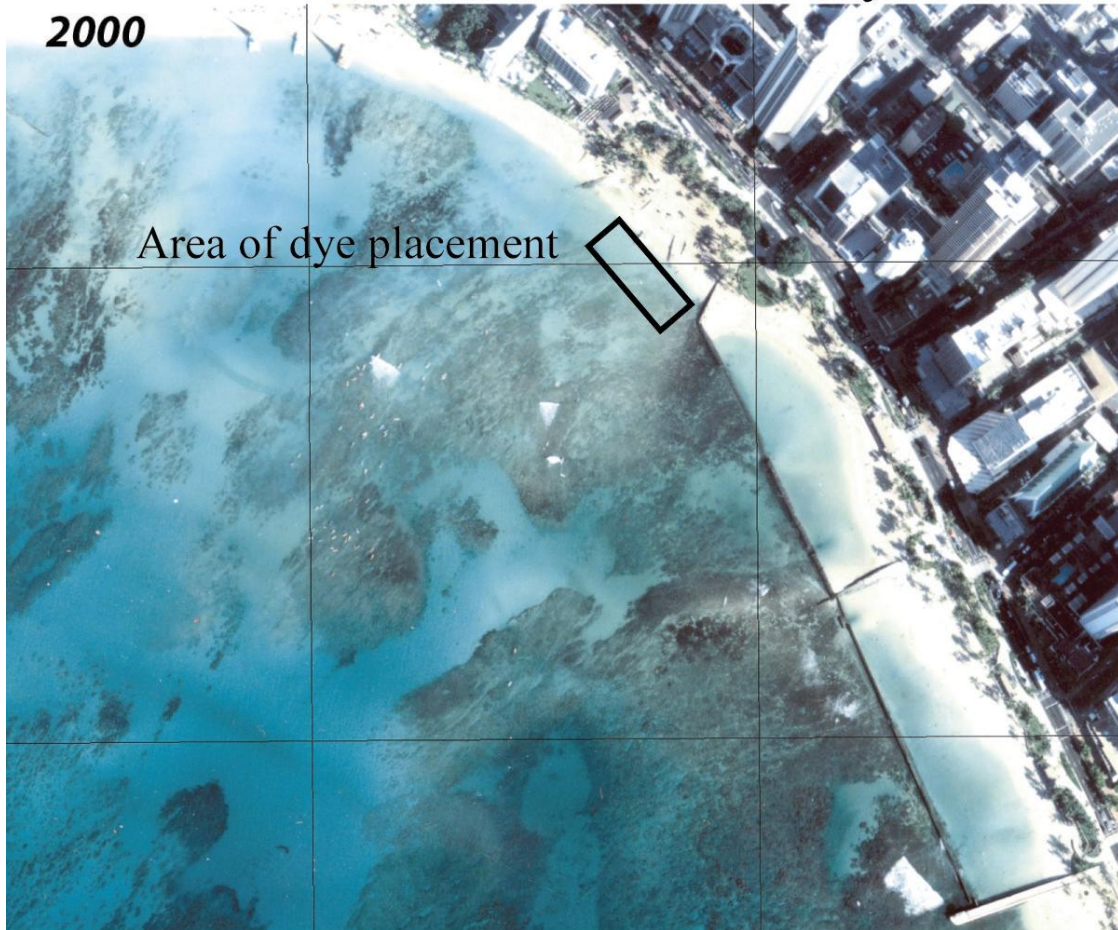
#### Kuhio Beach Transport Trends

Based on this project the following qualitative figure has been created to help illustrate the dominant transport mechanisms observed on the day of the study.



**Figure 1 Site Map**

Area of current study



**Figure 2. Time Lapse Frame Grabs- Kuhio Beach**



0 Minutes



+2 Minutes



+4 Minutes



+6 Minutes



**Figure 3. Dominant Transport Direction**  
(Note wave refraction patterns fronting break walls)



**Figure 4. Time Lapse Frame Grabs –Duke’s Restaurant**



0 Minutes



+6 Minutes



+12 Minutes



+24 Minutes